

**2004  
KANSAS WATER QUALITY  
ASSESSMENT  
(305(b) REPORT)**



**April 1, 2004**

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## **PART I: EXECUTIVE SUMMARY/OVERVIEW**

This report, the *2004 Kansas Water Quality Assessment*, also known as the 305(b) Report, is the biennial assessment of the state's surface water quality as required by 33 USC 466 *et seq.*, the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act. The guidance by U. S. Environmental Protection Agency (US EPA) for the preparation of this report provided options for reporting. The Kansas Department of Health and Environment (KDHE) elected to provide an electronic report accompanied by an abbreviated narrative report. The abbreviated narrative report contains only the information required by law that has **changed** from the last report (2002 Kansas Water Quality Assessment April 1, 2002) and a simple reference to that report.

The Kansas Department of Health and Environment assessed water quality for the period January 2000 through December 2003. This assessment involved 19,501 miles of streams, all of which were considered monitored. The assessment mileage represents a decrease of 321 miles from the 2002 305(b) Report. This is due to minor changes in the beginning and ending assessment locations of some stream segments and to exclusion of all stream segments upstream of Native Indian reservations or classified surface water impoundments. A total of 188,190 lake acres were assessed. Of these, 175,709 acres were monitored and the conditions of an additional 12,481 lake acres were evaluated using best professional judgement.

An assessment of cumulative designated use stream mileage revealed that 92 % of the designated uses were fully or partially supported. Approximately, 45 % (in stream miles) of this mileage supported all assessed designated uses. Of the assessed lakes, 24 % of the total acres were fully supporting or threatened for at least one designated use and 72 % were impaired for one or more uses.

The *2004 Kansas Water Quality Assessment* includes four years of ambient stream chemistry data (2000 - 2003). Owing to data limitations the report does not assess waterbody attainment of primary contact recreation and chronic aquatic life support uses. Fish consumption advisories and swimming beach closures were applied in lieu of published criteria for food procurement and primary contact recreation. These approaches are consistent with the 1997 US EPA guidance. The assessments contained in this report are otherwise consistent with the application of the numeric and narrative 2003 Kansas surface water quality criteria or in the case of secondary contact recreation, the 2001 Kansas surface water quality criteria (see Part II).

The major causes of nonsupport for streams, in order of prevalence, are organic enrichment, salinity (chlorides and sulfates), pathogen indicators (fecal coliform), and pH. The major causes for lake impairments are sediments, turbidity, taste and odor, and nutrients/eutrophication.

Sources responsible for widespread pollutant loadings and beneficial use impairments of streams include agriculture (nonirrigated and irrigated crop production, grazing-related sources, and intensive animal feeding operations), groundwater withdrawal, habitat modification, and natural sources. Major sources for lake impairment include agriculture and municipal point sources.

Of the assessed lake acreage in Kansas, 71% appears stable over time, while slightly more than 19% appears to be undergoing measurable eutrophication. Four percent of total lake acres show appreciable improvement in trophic state condition during this reporting cycle. Municipal point sources, natural sources, and agriculture are the primary contributing factors to lake eutrophication.

The imposition of more stringent permit limits and the resulting upgrades of municipal and industrial wastewater treatment facilities continue to result in notable improvements in surface water quality. As the number of point sources causing or contributing to significant water quality impairments continues to decline, future attention will necessarily shift to the remaining sources, primarily nonpoint sources. It is anticipated that watershed pollution control efforts, predicated on the development of Total Maximum Daily Loads (TMDLs) and on the allocation of allowable pollutant loadings among point, nonpoint, and natural sources, will play an increasingly important role in the abatement of surface water pollution and improvement in water quality in Kansas. By June 30, 2004, Kansas will have established TMDLs for all high priority waterbodies listed in the 1998 Kansas 303(d) List.

## **PART II: BACKGROUND**

Updated data are provided in the tables that follow. There are no significant changes since the 2002 (b) Report.

Table 1.	Kansas Atlas
Table 2.	Number of Active KWPC and NPDES Permits
Table 3.	Permit Compliance Record
Table 4a.	319 Program Project History
Table 4b.	Summary of Local Environmental Code Adoption Trough 2003
Table 5.	KDHE Cooperative Funding for Construction of Municipal Wastewater Treatment Facility Upgrades and Expansions

**Table 1. Kansas Atlas**

TOPIC	VALUE
State population	2,723,507
State surface area in square miles	81,778
Number of major river basins	12
Total number of interior stream miles (US EPA RF3/DLG)	134,338
Number of border stream miles	120
Number of perennial stream miles	23,731
Number of intermittent stream miles	110,225
Number of ditch and canal miles*	382
Number of lakes/reservoirs/ponds (publicly owned)	316
Acres of lakes/reservoirs/ponds (publicly owned)	188,190
Acres of public freshwater wetlands	35,607

\* Not applicable after Sept. 1, 2001, K.S.A. 82a-2001

**Table 2. Number of Active KWPC and NPDES Permits\***

NUMBER OF PERMITTED FACILITIES					
Municipal and Commercial		Industrial/Federal		Agricultural	
Total Municipal and Commercial KWPC (non-overflowing)	426	Total Industrial/Federal KWPC (non-overflowing)	100	Agricultural NPDES	432
Discharging Lagoons	349	Total Industrial (discharging)	456	Agricultural State	1,184
Mechanical Treatment Facilities	169	Pretreatment	47	Agricultural Certifications	1,408
<b>TOTAL</b>	<b>944</b>		<b>603</b>		<b>3,024</b>

KWPC = Kansas Water Pollution Control

\* as of January 1, 2004

NPDES = National Pollutant Discharge Elimination System

**Table 3. Permit Compliance Record.** "Absolute" Compliance\* for WWTFs  
Excluding Non-Discharging Lagoons.

YEAR	TYPE OF FACILITY	
	MUNICIPAL & COMMERCIAL	INDUSTRIAL
2001	83%	94%
2002	86%	95%
<b>TOTAL NUMBER</b>	<b>518</b>	<b>442</b>

WWTF = Wastewater Treatment Facility

\*Absolute compliance means that the facility reported all parameters required by the permit and met all permit limits for the monitoring period.

## Nonpoint Source Pollution Control

Nonpoint Source (NPS) Implementation: Kansas' goal is to assure implementation of recommended water quality protection measures by all nonpoint pollutant sources. Implementation is facilitated through information and education, financial assistance, technical assistance, technology transfer and enforcement where mandatory water quality protection measures are established. Implementation, administration and facilitation are accomplished through the coordination and collaboration of state, local and federal agencies and private sector organizations.

Information and Education - The goal of the NPS Public Information Program is to inform and educate Kansans concerning the value of the State's water resources. The program emphasizes prevention of nonpoint source pollution, rehabilitation of polluted waters, and an understanding of the requirements and objectives of the Kansas NPS Pollution Control Program.

Technical Assistance - Some portion of Section 319 grant funds will be used to support technical assistance activities of partner organizations. Examples of such support include the Kansas Rural Center Clean Water Farms program, the River Friendly Farmer program, the Kansas Wetland and Riparian Areas Alliance, and watershed assessments performed by Kansas State University for local project sponsors.

Technology Transfer - Technology transfer involves identifying activities and practices that if implemented will reduce the quantity of pollutants released or discharged from a nonpoint pollutant sources, assessing and evaluating the effectiveness of these practices and training designers, technical assistance providers and owners of nonpoint pollutant sources in how and when to use these technologies.

Watershed Restoration and Protection Strategy (WRAPS) - The Watershed Restoration and Protection Strategy is a planning process to identify all the water quality protection and restoration needs of a HUC8 (Hydrological Unit Code) watershed. The WRAPS serves to integrate TMDL implementation, water quality restoration, water quality protection, Source Water Protection and Wellhead Protection activities required under the Safe Drinking Water Act and habitat restoration and protection activities.

**Table 4a. 319 Program Project History.** Monetary units given in dollars (1992 through 2003).

PROJECT TYPE	NUMBER OF PROJECTS	PROJECT TOTALS
Information and Education	127	3,637,978.98
Technical Assistance	179	8,935,272.53
Technology Transfer	39	1,754,200.00
WRAPS	57	4,183,505.23
<b>TOTAL</b>	<b>402</b>	<b>18,510,956.74</b>

Local Environmental Protection Program (LEPP) - The LEPP, administered by KDHE and funded by the Kansas Water Office (KWO) under the auspices of the State Water Plan, provides financial assistance to local governmental units to develop and implement a local environmental protection plan. The authorizing statute requires the local environmental protection plan to include a sanitary code and to provide plans to address subdivision water and wastewater, solid waste, hazardous waste, public water supply protection, and Non Point Source (NPS) pollution. Presently, 100 of 105 Kansas counties are participating in the program. Environmental code adoption has been a priority effort since the beginning of the program.

**Table 4b. Summary of Local Environmental Code Adoption through 2003**

STATUS	NUMBER
Adopted and Being Administered	101
Approved for Adoption	2
Being Developed	0
No Action	2

Source Water Assessment Program – The 1996 amendments to the Safe Drinking Water Act require each state to implement a source water assessment program or SWAP. The Kansas SWAP plan was approved by the US EPA in February 2001 with a mandate to complete source water assessments in Kansas by June 2004. In December 2001, KDHE contracted with Burns & McDonnell to help administer the Kansas SWAP Program and develop an internet based Automated Source Water Assessment Tool (ASWAT). During 2002 and 2003, ASWAT was utilized by public water supplies and their technical assistance providers to complete local source water assessments. To date, 763 source water assessments were completed in Kansas, which includes an assessment for every public water supply that treats and distributes raw source water. The following is a brief summary of Kansas SWAP findings.

On a statewide level, 54 percent of the 677 groundwater public water supplies (PWSs) received a low susceptibility analysis score, 45 percent received a moderate score, and 1 percent received a high score. Also on a statewide basis, 51 percent of the surface water PWSs received low scores, 43 percent received moderate scores, and 6 percent received high scores.

The final Kansas SWAP report will be submitted to EPA by June 2004, meeting the regulatory deadline. The final Kansas SWAP report and local source water assessments will be available on the Watershed Management Section website at [www.kdhe.state.ks.us/nps](http://www.kdhe.state.ks.us/nps) after June 2004.

**Table 5. KDHE Cooperative Funding for Construction of Municipal Wastewater Treatment Facility Upgrades and Expansions.** Monetary units given in millions of dollars.

FEDERAL FUNDING YEAR (FFY)	KWPCRF*		CDBG**		RD***	TOTAL****
	Basic Leveraged		Federal	Total	Federal	
2002	30.723	50.512	4.380	4.500	1.533	91.648
2003	16.779	18.240	3.721	3.907	7.174	49.821
<b>TOTAL</b>	<b>47.502</b>	<b>68.752</b>	<b>8.101</b>	<b>8.407</b>	<b>8.707</b>	<b>141.469</b>

\* KWPCRF= Kansas Water Pollution Control Revolving Fund

\*\* CDBG = Community Development Block Grant

\*\*\* RD = Rural Development CDBG Funding match



### **PART III: SURFACE WATER ASSESSMENT**

The KDHE maintains four primary water quality monitoring programs. These address (1) the chemical and physical properties of streams and rivers, (2) the biological properties of streams and rivers, with emphasis on aquatic and semiaquatic macroinvertebrate communities, (3) the physiochemical and biological properties of lakes and wetlands, and (4) contaminant concentrations in the tissues of bottom-feeding fish. There have been no significant changes in the monitoring programs from those described in the 2000 305(b) Report with the exception of (1) establishment of additional surface water monitoring sites and (2) the indefinite suspension of the statewide groundwater quality monitoring program owing to recent budgetary constraints.

Appendix A lists the parameters which were analyzed for by the KDHE, Division of Laboratories or by the Bureau of Environmental Field Services. The current Section 106 monitoring strategy has not changed since the last Report, and therefore, is not included here. The Agency plans to comprehensively renew and revamp this strategy prior to the next (2006) 305(b) Report. The accompanying maps depict the locations of sampling sites used for this report.

- Figure 1. Stream Chemistry Monitoring Network
- Figure 2. Stream Biological Monitoring Network
- Figure 3. Lake and Wetland Monitoring Network
- Figure 4. Fish Tissue Monitoring Network

The assessments of streams and rivers were conducted in the same manner as the 2002 305(b) Report. However, the assignment of stream miles assessed by chemical and physical parameters was slightly altered and, therefore, the new protocol for assignment of stream miles to a monitoring site is included:

In the spatial application of the physicochemical and microbiological data, the department applied several simplifying assumptions. The foremost assumption was that each network site effectively “monitored” all unimpounded upstream National Hydrography Dataset (NHD) segments within a 30-kilometer radius and all downstream main stem segments within 15-kilometers. The previous 305(b) Report used River Reach File (RF) 2.0 and listed RF3 segments and subsegments. This was changed for the current Report to using NHD and geocoded site locations. There were several exceptions to this rule:

- 1) If an upstream tributary segment extended outside the radius, the segment was considered monitored only if more than 50% of its length was within the radius.
- 2) If a (main stem) segment originated within the “assessment reach” of a network site, and a significant portion (10 – 20%) fell within the assessment reach, then the entire segment was regarded as monitored unless point sources or major tributary confluences outside the reach were expected to significantly influence water quality.
- 3) If a monitoring site occurred on a tributary within the assessment reach of a downstream (main stem) site, use support determinations for the tributary were based on data from the tributary site.
- 4) If the separation distance between sites was less than 45 kilometers, use support summaries for overlapping assessment reaches were based on data from the downstream

monitoring site. Such overlapping reaches generally occurred on larger (main stem) streams.

- 5) Ditches, irrigation canals, major classified impoundments and their upstream segments were excluded from the assessment (except for Empire Lake due to a short hydrological residence time).
- 6) If a major (>1.0 MGD) sewage treatment plant discharged within the assessment area, the assessment began at the treatment plant outfall when the monitoring site was located below the point source, or ended at the treatment plant outfall if the monitoring site was above the point source.
- 7) If a major sewage treatment plant discharged into a stream and two network sites closely bracketed the outfall location, the outfall location served as the delineation point between upstream and downstream assessment reaches.
- 8) Best professional judgment (BPJ) was utilized to include or exclude segments within the assessment distance if these segments were largely intermittent or of much smaller stream order.

This report utilized four years of stream chemistry data (2000 – 2003). The determinant water quality criteria and stream beneficial use designations were based on the 2003 Surface Water Quality Standards and the Kansas Surface Water Register (December 15, 2003). All numeric criteria were applied in accordance with EPA's Guidelines for the Preparation of the Comprehensive State Water Quality Assessment (305(b) Reports) and Electronic Updates (1997) with the exception of two water quality parameters. Total suspended solids (TSS) was assessed using the Kansas narrative criterion but was not included in the overall assessment; however, a separate basin summary of TSS for the four year period is included in Appendix B. Fecal coliform bacteria criteria and stream recreational use designations were based on the 2001 Surface Water Quality Standards and the Kansas Surface Water Register (June 1, 1999) due to the State not collecting sufficient Escherichia coli data and the recent re-designation of primary and secondary contact streams in the 2003 Surface Water Quality Standards (K.S.A. 2002 Supp. 82a-2001: cf., 2003 Kansas Surface Water Register). Only acute criteria were applied in the aquatic life support assessment because the ambient stream chemistry data derive from grab samples collected, for the most part, every two months. Therefore, these samples do not lend themselves to chronic assessments based on a 7-day or 30-day averaging period.

In assigning a support category to a particular designated use, the department consistently considered the "worse case" water quality parameter. For example, if a stream segment (or part of a segment) complied during the reporting cycle with all but one of the criteria for the protection of the livestock watering use, the segment or partial segment was deemed either partially supportive or nonsupportive of the use (depending on the severity of the pollution problem) and assigned to the "impaired" category for overall use support. Any parameter monitored on fewer than three occasions during the reporting cycle was excluded from this analysis. Similarly, sites monitored fewer than three times during the reporting cycle, such as sites episodically dry, were not considered in the 2004 305(b) Report assessment.

When listed NHD stream reaches were deemed either partially supportive or nonsupportive of a use, the department considered the pollutants (causes) of concern and attempted to determine the most probable sources of these pollutants. Informational materials used in this analysis were obtained both from within KDHE and from various other governmental agencies and institutions and included:

(1) GIS coverage and related maps depicting prevailing land uses, crop type, grazing livestock densities, and the location of major urban areas, highways, major municipal and industrial point sources, and permitted and certified feedlot facilities; (2) other maps and related written materials addressing regional topography, geology, soil characteristics, and the location of major mineral intrusion areas, active and inactive oil and natural gas fields, surface and subsurface mines, permitted irrigation wells, and documented groundwater and/or soil contamination sites; and (3) miscellaneous reports and publications regarding stream flow, stream channelization and dredging practices, pesticide and fertilizer application practices and application rates, brine disposal practices, and storm water quality.

An overall flow chart of the decision process for assessment of ambient stream data is included as Appendix C.

The assessment method for the data from the stream Biological Monitoring Program has been modified from the previous 2002 305(b) Report as follows:

Macroinvertebrate data from 1998 - 2002 and freshwater mussel data from 1991 through 2002 were utilized. A simple average of use support level was determined using a matrix of metrics for each assessed stream segment. Best professional judgment was applied in consideration of historical data trends, adequacy of data, and historical use support levels.

Aquatic life support for the mussel % loss metric was based on data from stations with greater than three samples and a minimum species richness of 5. No stations were given less than a "Full Support" ALUS rating unless at least three taxa or greater than 10% of the mussel community had been lost.

Assessments of less than "Full Support" at sites with less than 5 observations were made only when the magnitude of impact in any year or group of years was sufficient to predict a five observation percentile on which to base the assessment. Generally, biological monitoring consisted of one sample per year collected over three rotating seasons.

Historical trends were also used in making biological assessments in cases where metrics were near the use support category break points. Other data considered included Kansas Department of Wildlife and Parks fisheries data and the unionid mussel data.

Criteria used for fish consumption advisories and aquatic life and food procurement use support were as follows:

1. If a chlordane fish consumption advisory was in effect, then aquatic life and food procurement were automatically assigned "Not Supported".
2. The following Macroinvertebrate Biotic Index (MBI), Kansas Biotic Index (KBI), Ephemeroptera, Plecoptera and Trichoptera (EPT) Index, EPT Abundance, and MUSSEL%Loss assessments were utilized for determination of aquatic life use support (ALUS):

<u>ALUS</u>	<u>MBI</u>	<u>KBI-NO</u>	<u>EPT</u>	<u>EPT Abundance</u>	<u>Mussel%Loss</u>
FS	≤4.5	≤2.60	≥13	≥48%	≤10%
PS	4.51-5.39	2.61-2.99	12 - 8	47% - 31%	11-25%
NS	≥5.4	≥3.0	<8	≤30%	≥26%

3. The MBI and KBI-NO used in consideration of the determination of aquatic life use support were intended to assess the response of biological communities to organic contaminants and nutrient enrichment. Therefore, the biological and chemical assessments were applied as independent variables.

In cases where chemical data and biological data differed in terms of assessment, the department evaluated each discrepancy on a case-by-case basis. The staff used BPJ for the assignment of the impairment level and the rationale was documented.

Summary tables, although not required, have been provided as follows:

Table 6a.	Summary of Fully Supporting, Threatened and Impaired Stream Miles
Table 6b.	Summary of Fully Supporting, Threatened, and Impaired Lakes)
Table 7a.	Individual Use Support Summary for Streams
Table 7b.	Individual Use Support Summary for Lakes
Table 8a.	Total Stream Mileage Impaired by Various Cause Categories
Table 8b.	Total Lake Acres Impaired by Various Cause/Stressor Categories
Table 9a.	Total Stream Mileage Impaired by Various Source Categories
Table 9b.	Total Lake Acres Impaired by Various Source Categories
Table 10.	Trophic Status of Lakes Assessed During This Reporting Cycle
Table 11.	Trophic State Trends in Lakes
Table 12a.	Summary of Domestic Water Supply Use Impairments in Streams
Table 12b.	Summary of Domestic Water Supply Use Impairments in Lakes

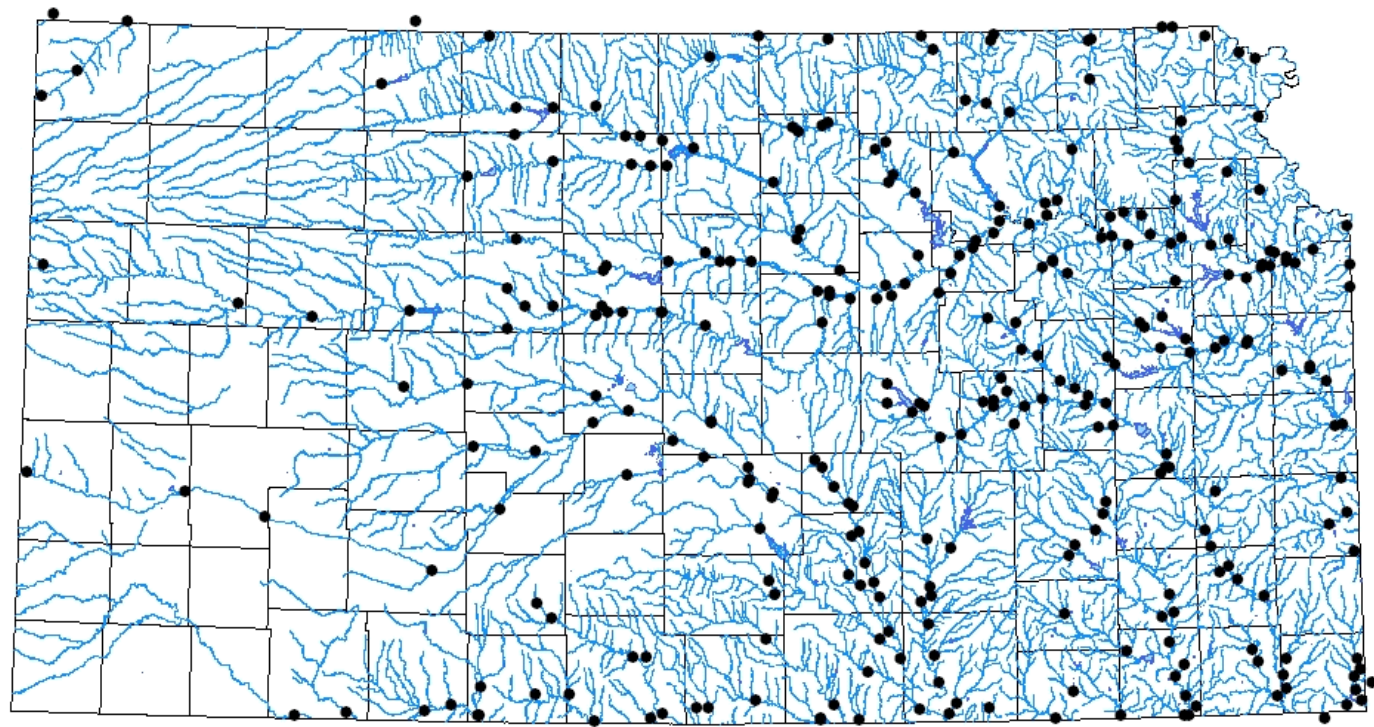
The lake and wetland monitoring operations conducted by KDHE have significantly changed since the inception of the program in 1975. Since 1993, the network has consisted of approximately 120-130 monitored sites, with representative lakes in all major river basins and physiographic regions. These lakes and all major publicly owned wetland areas are sampled on a three to five-year cycle for nutrients, metals, minerals, pesticides, water clarity, dissolved oxygen, temperature, algal abundance, and bacterial quality (Appendix A.)

In addition to those lakes and wetlands routinely included in this program (and regarded as "monitored" waterbodies for the purposes of this report), a number of additional standing waterbodies were subjected to less intensive investigation during the 1999-2003 reporting cycle. These "evaluated" waterbodies included lakes from which a single grab sample was collected and analyzed for major cations and anions, nutrients and chlorophyll-a. In other cases, additional physicochemical and biological data were collected and/or a watershed survey was conducted.

In compliance with Section 314(a)(2) of the Clean Water Act, an assessment report of lake water quality is presented in Appendix D. The required tables are included in Part III.

# FIGURE 1. STREAM CHEMISTRY MONITORING NETWORK

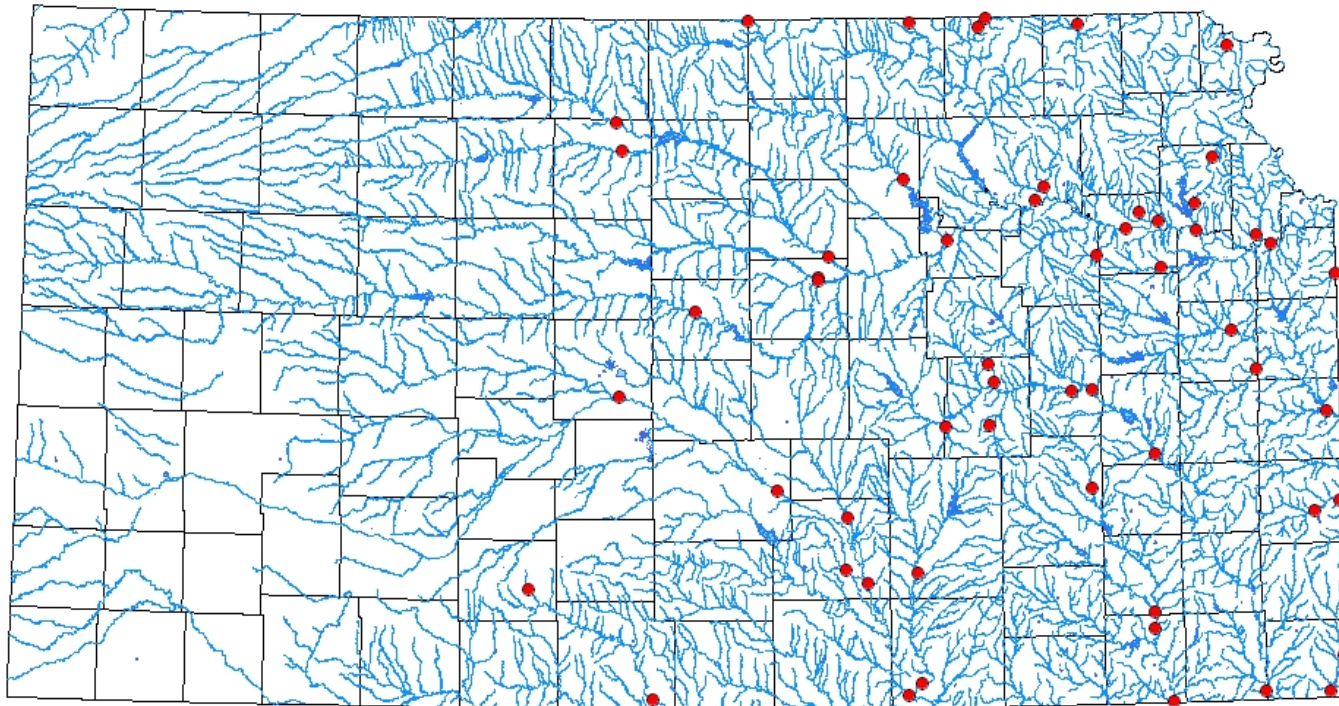
2000 - 2003



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## FIGURE 2. STREAM BIOLOGICAL MONITORING NETWORK

1998 - 2002

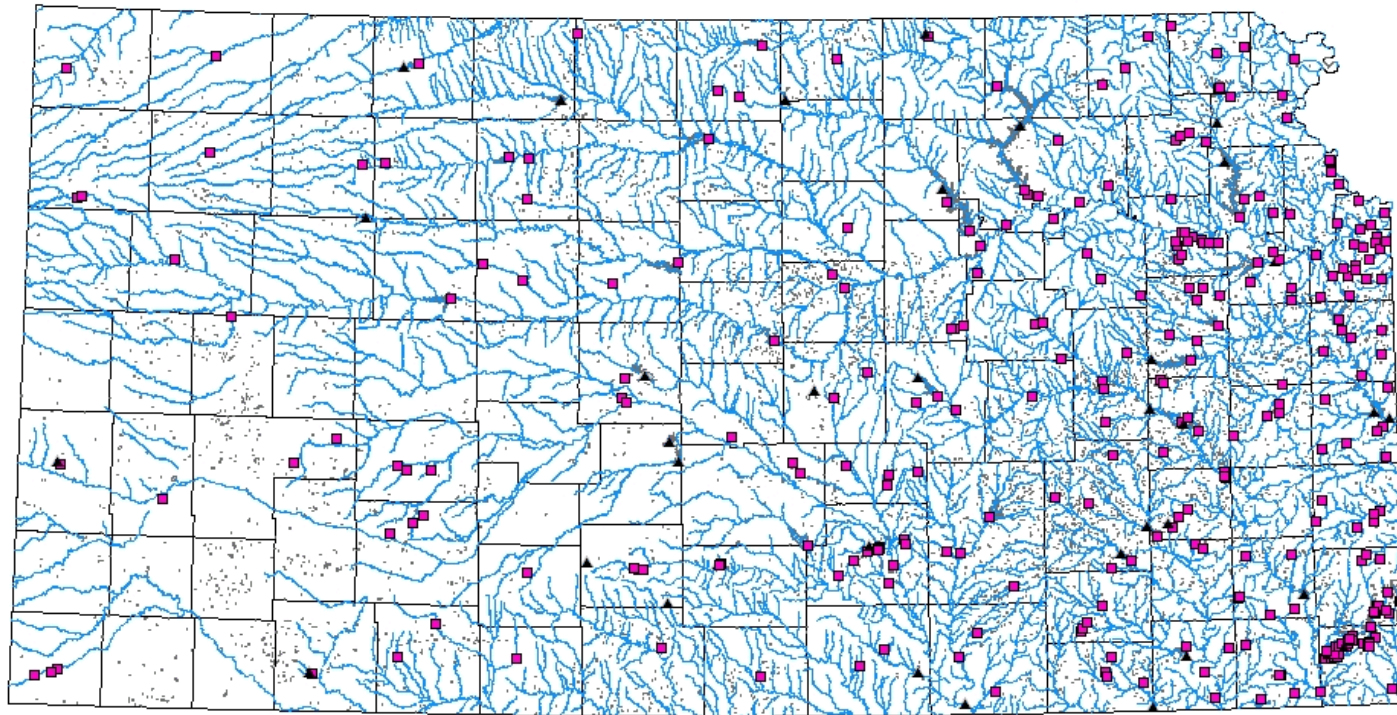


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### FIGURE 3. LAKE AND WETLAND MONITORING NETWORK

1999 - 2003

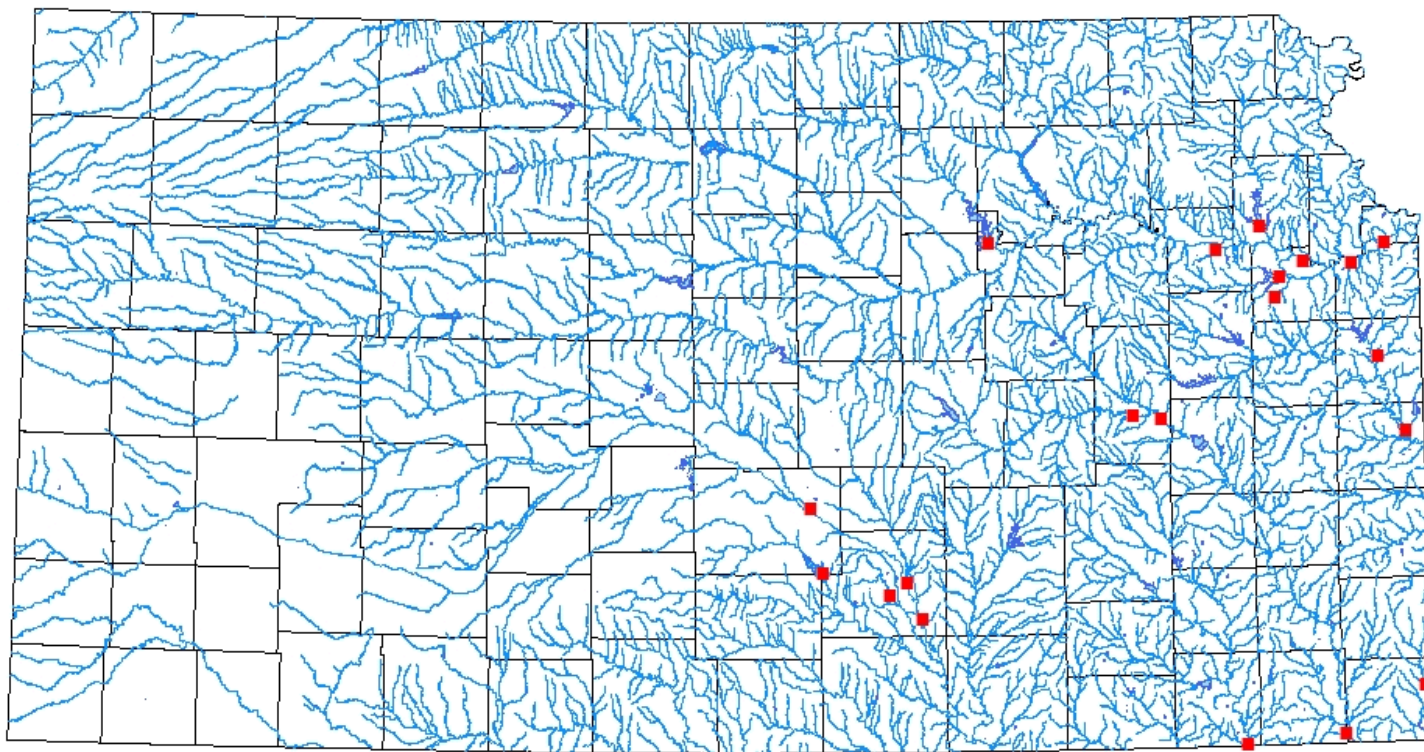


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■ Lake  
▲ Wetland

## FIGURE 4. FISH TISSUE MONITORING NETWORK

2000 - 2002



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**Table 6a. Summary of Fully Supporting, Threatened, and Impaired Streams Miles**

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED SIZE
	EVALUATED	MONITORED	
Size Fully Supporting All Assessed Uses	0	8,700	8,700
Size Fully Supporting All Assessed Uses but Threatened for at Least One Use	0	0	0
Size Impaired for One or More Uses	0	10,801	10,801
<b>TOTAL SIZE ASSESSED</b>	0	19,501	19,501

**Table 6b. Summary of Fully Supporting, Threatened, and Impaired Lakes (in acres)**

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED ACRES
	EVALUATED	MONITORED	
Insufficient Data	7,038	39	7,077
Fully Supporting	932	27,332	28,264
Threatened for one or more uses	325	16,684	17,009
Size impaired for one or more uses	4,186	131,654	135,840
<b>TOTAL SIZE ASSESSED</b>	12,481	175,709	188,190

**Table 7a. Individual Use Support Summary for Streams (in miles)**

GOALS	USE	SIZE ASSESSED	SIZE FULLY SUPPORTING	SIZE FULLY SUPPORTING BUT THREATENED	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	SIZE NOT ATTAINABLE
PROTECT AND	Aquatic Life (acute only)	19,501	11,621	0	5,236	2,644	0
PROTECT AND ENHANCE PUBLIC HEALTH	Fish Consumption	373	167	0	0	206	0
	Shell fishing	*	*	*	*	*	*
	Swimming	*	*	*	*	*	0
	Secondary Contact	19,373	15,151	0	3,302	920	0
	Domestic Water Supply	1,098	855	0	13	231	*
SOCIAL AND ECONOMIC	Agricultural**	*	*	*	*	*	*
	Cultural or Ceremonial	*	*	*	*	*	*
	State Defined 1. Irrigation 2. Livestock	7,771 7,877	7,368 7,613	0 0	98 63	304 201	* *
CUMULATIVE MILAGE		55,993	42,775	0	8,712	4,506	0

\* = category not applicable

\*\* = see state defined below

0 = category applicable but size of waters in category is zero

**Table 7b. Individual Use Summary in Acres for Lakes ( in acres)**

GOALS	USE	SIZE ASSESSED	SIZE FULLY SUPPORTING	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	INSUFFICIENT DATA
			SIZE THREATENED			
Protect & Enhance Ecosystems	Aquatic Life (acute criteria)	188,190	75,448	61,259	18,953	7,077
			25,453			
Protect & Enhance Public Health	Fish Consumption**	188,190	165,188	10,194	328	12,480
			0			
	Shellfishing	*	*	*	*	*
	Primary Contact	188,190	41,612	112,258	3,877	7,077
			23,366			
	Secondary Contact	188,190	87,918	64,876	2,599	7,077
			25,720			
	Domestic Water Supply	188,190	31,981	89,105	36,661	7,077
			23,366			
Social & Economic Enhancement	Agricultural (irrigation)	188,190	137,601	14,970	2,822	7,077
			25,720			
	Agricultural (livestock)	188,190	137,290	14,930	3,173	7,077
			25,720			
	Cultural	*	*	*	*	*

\* = category not applicable

\*\* = based on fish consumption advisories and food procurement criteria

**TABLE 8a. Total Stream Mileage Impaired by Various Cause/Stressor Categories**

CAUSE/STRESSOR CATEGORY	SIZE OF WATER BY CONTRIBUTION TO IMPAIRMENT IN MILES	
	MAJOR	MODERATE/MINOR
Cause/Stressor unknown	*	*
Unknown toxicity	*	*
Pesticides**	233	0
Priority organics	*	*
Nonpriority organics	*	*
Metals (Cadmium, Copper, Selenium, Zinc)	81	548
Ammonia	0	0
Cyanide	*	*
Sulfates (Livestock watering)	257	0
Chlorine	*	*
Other inorganics (Boron, Beryllium, Fluoride)	374	54
Nutrients**	73	273
Nitrate	0	13
pH	647	1,617
Siltation**	58	511
Organic enrichment/low DO	1,132	3,737
Salinity/TDS/chlorides/sulfates	1,129	111
Thermal modifications	0	719
Flow alterations	*	*
Other habitat alterations	*	72
Pathogen indicators	920	3,302
Radiation	*	*
Oil and grease	*	*
Taste and odor	*	*
Suspended solids	*	*
Noxious aquatic plants (macrophytes)	*	*
Total toxics	*	*
Turbidity	*	*
Exotic species	*	*
Excessive algal growth	*	*
Inappropriate littoral vegetation	*	*

\* = category not applicable for the purposes of this report

\*\* = based on biological site assessments only

**Table 8b. Total Lake Acres Impacted by Various Cause Categories (in acres)**

CAUSE CATEGORY	ACRES BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause unknown	0	0
Unknown toxicity	-	-
Pesticides	0	791
Priority organics	-	-
Nonpriority organics	-	-
Metals	0	19,713
Ammonia	-	-
Chlorine	-	-
Other inorganics (boron or fluoride)	41	204
Nutrients/eutrophication	26,054	120,155
pH	559	4,233
Siltation	*	*
Organic enrichment/low DO	190	33,566
Salinity/TDS/chlorides	9,216	23,382
Thermal modifications	-	-
Flow alterations	305	3,610
Other habitat alterations	-	-
Pathogen indicators	0	0
Radiation	-	-
Oil and grease	-	-
Taste and odor**	17,582	-
Suspended solids***	42,659	19,438
Noxious aquatic plants	264	167
Total toxics	-	-
Turbidity***	42,659	19,438
Exotic species	0	8,000
Other (specify)	-	-

- = Category applicable, no data available.

\* = Statewide problem, no direct measurements available

\*\* = Reflects problems severe enough to request KDHE assistance. The majority of incidents are unreported.

\*\*\* = Based on multiple metrics

**TABLE 9a. Total Stream Mileage Impaired by Various Source Categories**

SOURCE CATEGORY	CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources	110	40
Municipal Point Sources	778	2,513
Combined Sewer Overflows	10	99
Collection System Failure	15	62
Domestic Wastewater Lagoon	*	*
Agriculture	3,259	6,499
Crop-related sources	1,845	3,369
Grazing-related sources	1,944	5,846
Intensive Animal Feeding Operations	1,617	4,962
Silviculture	*	*
Construction	0	35
Urban Runoff/Storm Sewers	333	402
Resource Extraction	668	184
Land Disposal	71	144
Hydromodification	806	1,158
Habitat Modification (non-hydromod)	1,919	5,965
Marinas and Recreational Boating	*	*
Erosion from Derelict Land	*	*
Atmospheric Deposition	0	42
Waste Storage/Storage Tank Leaks	*	*
Leaking Underground Storage Tanks	*	*
Highway Maintenance and Runoff	0	0
Spills (Accidental)	*	*
Contaminated Sediments	54	0
Debris and Bottom Deposits	*	*
Internal Nutrient Cycling (primarily lakes)	*	*
Sediment Resuspension	*	*
Natural Sources	2,789	4,400
Recreational and Tourism Activities	*	*
Salt Storage Sites	121	0
Groundwater Loadings	*	*
Groundwater Withdrawal	1,087	900
Other	0	
Unknown Source	70	0
Sources Outside State Jurisdiction/borders	307	248

\* = category not applicable

**Table 9b. Total Lake Acres Impaired by Various Source Categories**

SOURCE CATEGORY	CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources	-	-
Municipal Point Sources	30,193	116,179
Combined Sewer Overflows	-	-
Agriculture	54,529	102,318
Silviculture	-	-
Construction	-	-
Urban Runoff/Storm Sewers	406	7,120
Resource Extraction	0	1,241
Land Disposals	-	-
Hydromodification	3,446	6,047
Habitat Modification	-	-
Marinas	-	-
Atmospheric Deposition	0	799
Contaminated Sediments	-	-
Unknown Source	0	0
Natural Sources*	9,879*	24,084*
In-Lake Management Techniques**	150	45
Other (specify)	-	-

- = Category applicable, no data available.

\* = Refers mainly to in-lake ecophysiological processes (processes secondary to eutrophication, for instance), wind resuspension phenomena, and climate variations, with very little actual background pollution loading from watersheds included except for instances of excessive waterfowl.

\*\* = Many in-lake management techniques can impact water quality in unintended ways.

**Table 10. Trophic Status of Lakes Assessed During This Reporting Cycle** (Percent of total in parentheses)

<b>TROPHIC STATUS</b>	<b>NUMBER OF LAKES</b>	<b>ACREAGE OF LAKES</b>
Argillotrophic	16 (5.1)	51,140 (27.2)
Oligo-Mesotrophic	13 (4.1)	405 (0.2)
Mesotrophic	34 (10.8)	11,738 (6.2)
Slightly Eutrophic	41 (13.0)	53,204 (28.3)
Fully Eutrophic (Eutrophic)	58 (18.4)	47,621 (25.3)
Very Eutrophic	39 (12.3)	13,605 (7.2)
Low Hypereutrophic	24 (7.6)	646 (0.3)
High Hypereutrophic	48 (15.2)	2,529 (1.3)
Dystrophic	0	0
Unknown	43 (13.6)	7,302 (3.9)
<b>TOTAL</b>	<b>316 (100.0)</b>	<b>188,190 (100.0)</b>

**Table 11. Trophic State Trends in Lakes** (% of total in parentheses)

<b>CATEGORY</b>	<b>NUMBER OF LAKES</b>	<b>ACREAGE OF LAKES</b>
Assessed for Trends	316 (100%)	188,190 (100%)
Improving	3 (0.9%)	6,906 (3.7%)
Stable	102 (32.3%)	133,168 (70.7%)
Degrading	35 (11.1%)	35,780 (19.0%)
Trend Unknown	176 (55.7%)	12,336 (6.6%)



**Table 12a. Summary of Domestic Water Supply Use Impairments in Streams**

<b>Total Stream Mileage Designated for Use:12,122</b> <b>Total Stream Mileage Assessed for Use: 1,099</b>			
	<b>Miles</b>	<b>Percent</b>	<b>Major Causes</b>
<b>Fully Supporting Use</b>	855	77	
<b>Fully Supporting Use but Threatened</b>	*	*	
<b>Partially Supporting Use</b>	13	1	
<b>Not Supporting Use</b>	231	21	sulfate** chloride**
<b>Total Assessed for Use</b>	1,099	100	

\* not applicable

\*\* secondary MCLs; not enforceable standard under the Safe Drinking Water Act

**Table 12b. Summary of Domestic Water Supply Use Impairments in Lakes**

<b>Total Waterbody Area Designated For Use: 150,078 acres (79.7% of Assessed Acres)</b>			
<b>Total Waterbody Area Assessed For Use: 188,190 acres</b>			
	<b>Acres</b>	<b>Percent</b>	<b>Major Causes</b>
<b>Insufficient Data</b>	6,364 (7,077)	4 (4)	
<b>Fully Supporting Use</b>	29,593 (31,981)	20 (17)	
<b>Threatened but Fully Supporting</b>	23,267 (23,366)	16 (13)	
<b>Partially Supporting Use</b>	76,898 (89,105)	51 (47)	eutrophication chloride* sulfate*
<b>Not Supporting Use</b>	13,956 (36,661)	9 (19)	eutrophication atrazine chloride* sulfate*
<b>Total Assessed For Use</b>	150,078 (188,190)	100 (100)	

\*secondary MCLs; not enforceable standard under the Safe Drinking Water Act

## **PART IV: GROUNDWATER**

The Kansas Groundwater Monitoring Network was discontinued in 2001. Any groundwater monitoring done in the State was through Remediation, Waste Management, or PWS Programs.

Summary tables have been provided as follows:

Table 14.	Summary of State Groundwater Protection Programs
Table 15.	Major Sources of Groundwater Contamination
Table 16.	Groundwater Contamination Summary
Table 17.	Aquifer Monitoring Data

**Table 14. Summary of State Groundwater Protection Programs**

<b>Programs or Activities</b>	<b>Check (X)</b>	<b>Implementation Status</b>	<b>Responsible State Agency</b>
Active SARA Title III program	X	fully established	KDHE*
Ambient groundwater monitoring			
Aquifer vulnerability assessment	X	on going	KDHE*
Aquifer mapping	X	fully established	KGS
Aquifer characterization	X	on going	KGS
Comprehensive data management	X	on going	KDHE
EPA-endorsed Core Comprehensive State Groundwater Protection Program	X	under review	KDHE
Groundwater discharge permits	X	fully established	KDHE
Groundwater Best Management Practices	X	fully established	KDHE
Groundwater quality standards			
Interagency coordination for groundwater protection initiatives	X	on going	KWO
NPS controls	X	fully established	KDHE*
Pesticide State Management Plan	X	EPA approved plan implementation proceeding	KDA
Pollution Prevention Program	X	fully established	KDHE
RCRA Primacy	X	fully established	KDHE
Source Water Assessment Program (SWAP	X	fully established	KDHE
State Superfund	X	fully established	KDHE
State RCRA with more stringent requirements than RCRA Primacy	X	fully established	KDHE
State septic system regulations	X	fully established	KDHE
Underground Storage Tank (UST) installation requirements	X	fully established	KDHE
UST Remediation Fund	X	fully established	KDHE
UST Permit Program	X	fully established	KDHE
Underground Hydrocarbon Storage Well Program	X	fully established	KDHE
Underground Injection Control Program	X	fully established	KCC & KDHE
Vulnerability assessment for drinking water/wellhead protection	X	EPA approved plan implementation proceeding	KDHE
Well abandonment regulations	X	fully established	KDHE
Wellhead Protection Program (EPA-approved)	X	EPA approved plan implementation proceeding	KDHE
Well installation regulations	X	fully established	KDHE

\*principal administrative agency

**Table 15. Major Sources of Groundwater Contamination**

Ten Highest Priority Contaminant Sources	Factors Considered in Selecting a Contaminant Source	Types of Contaminants
<b>AGRICULTURAL ACTIVITIES:</b> Ag. chemical facilities/applications	D,A,C	E,B,C
Animal feedlots	D,A,C	J,E
<b>STORAGE AND TREATMENT:</b> Storage tanks (AST/LUST)	D,B,A,C	D
Surface impoundments	E,A	J,E
<b>DISPOSAL ACTIVITIES:</b> Landfills/illegal dumping	E,C,A	H
<b>OTHER:</b> Active/abandoned industrial facilities	A,B,C	C,H
Oil and gas activities	D,A,B,C	D,G
Pipelines and sewer lines	E,A	D,E
Salt water intrusion	E,C,B	G
Spills	D,A	D,C
<b>Factors Considered in Selecting a Contaminant Source:</b> (A) Human health and/or environmental risk (toxicity) (B) Size of population at risk (C) Location of sources relative to drinking water sources (D) Number and/or size of contaminant sources (E) Hydrogeologic sensitivity		
<b>Types of Contaminants:</b> (A) Inorganic pesticides (B) Organic pesticides (C) Halogenated solvents (D) Petroleum compounds (E) Nitrate (F) Fluoride (G) Salinity/brine (H) Metals (I) Radionuclides (J) Bacteria (K) Protozoa (L) Viruses		

**Table16. Groundwater Contamination Summary.** Statewide Cumulative Summary Through December 31, 2003

Source Type	# of Kansas Sites	# of Sites with Confirmed Releases	# with Confirmed Groundwater Contamination	Primary Contaminants	# of Site Assessments	# of Sites with Source Removed	# of Sites with CAPs	# of Sites with Active Remediation	# of Sites with Cleanup Resolved
NPL	13	13	13	VOCs, metals	13	unavailable	1	7	5
CERCLIS (non-NPL)	690	690	690	VOCs, metals & pesticides	690	unavailable	unavailable	127	89
DOD/DOE	43	43	43	VOCs, metals	43	unavailable	unavailable	6	1
LUST	9,884	5,207	2,620	gasoline and diesel fuels	9,884	4,090	unavailable	2,328	2,818
RCRA Corrective Action	under EPA control								
Underground Injection *	32	0	0	0	0	0	0	0	0
Underground Hydrocarbon Storage Wells	10	1	0	methane	1	1	1	1	0
State Sites **	647	647	647	VOCs, metals	647	unavailable	unavailable	121	88
NPS	unknown								

CAPs - Corrective Action Plans

CERCLIS - Comprehensive Environmental Response, Compensation, and Liability Information System

DOD/DOE - Department of Defense/Department of Energy

LUST - Leaking Underground Storage Tanks

NPL - National Priority List

NPS - Non Point Source

RCRA - Resource Conservation and Recovery Act

\* Represents Class I and III injection wells and hydrocarbon storage sites, but does not include Class II brine injection wells.

\*\* Numbers do not include sites under KCC jurisdiction or LUST sites.

**Table17. Aquifer Monitoring Data**

Statewide summary for the period of 2000-2003

Monitoring Data Type	Total # of Well Samples in the Assessment	Parameter Groups	Parameters Not Detected or Nitrate #5 mg/L	Parameters Detected or Nitrate >5 to #10 mg/L	Parameters Exceeding the MCLs	Removed From Service	Background Parameters Exceeding MCLs
<b>Public Water Supply Network: groundwater sources*</b>	1,831	VOC	1,636	175*	20	30	0
	2,159	SOC	1,934	221	4	35	0
	1,831	EDB	1,765	61	5	30	0
	2,007	FLUORID	113	1,891	3	28	0
	1,659	MERCUR	1,643	15	1	28	0
	5,593	NITRATE	3,595	1,527	471	131	280
	1,659	SELENIU	203	1,450	6	28	57
NOTES: (1) Some wells may of been sampled more than once during the reporting period (2000-2003). (2) All data obtained from the Kansas Public Water Supply Monitoring Network. (3) Only inorganic parameters with federal drinking water MCLs were included in this summary. (4) Groundwater monitoring network samples were collected after well purging and prior to any treatment. (5) Some wells have more than one VOC parameter detected. (6) VOC= volatile organic compound; SOC=synthetic organic compound; EDB= ethylene dibromide. (*) Finished water after treatment; may have occasional surface water influence.							

# Appendix A: List of Parameters

## Stream Program

### Routine "Inorganic" Parameters

Alkalinity, total  
Aluminum  
Ammonia  
Antimony  
Arsenic  
Barium  
Beryllium  
Biochemical oxygen demand  
Boron, total  
Bromide  
Cadmium  
Calcium, total  
Chloride  
Chromium  
Cobalt  
Copper  
Dissolved oxygen  
Fluoride  
Hardness, total  
Iron  
Kjeldahl nitrogen  
Lead  
Magnesium, total  
Manganese  
Mercury  
Molybdenum  
Nickel  
Nitrate  
Nitrite  
Phosphate, ortho-  
Phosphorus, total  
Potassium, total  
Selenium  
Silica, total  
Silver  
Sodium, total  
Specific conductance  
Sulfate  
Thallium  
Total dissolved solids  
Total organic carbon  
Total suspended solids  
Turbidity  
Vanadium  
Zinc

### Routine Microbiological Parameters

Fecal coliform bacteria

### Field Measurements

pH  
Temperature

### Routine Organic Parameters

2,4-D  
2,4,5-T  
2,4,5-TP  
Acetochlor  
Alachlor  
Aldrin  
Atrazine  
Alpha-BHC  
Beta-BHC  
Delta-BHC  
Gamma BHC (Lindane)  
Butachlor  
Carbofuron (Furadan)  
Chlordane  
Cyanazine (Bladex)  
DCPA (Dacthal)  
DDD  
DDE  
DDT  
Dieldrin  
Endosulfan I  
Endosulfan II  
Endosulfan Sulfate  
Endrin  
Heptachlor  
Heptachlor epoxide  
Hexachlorobenzene  
Methoxychlor  
Metolachlor (Dual)  
Metribuzin (Sencor)  
PCB-1016  
PCB-1221  
PCB-1232  
PCB-1242  
PCB-1248  
PCB-1254  
PCB-1260  
Picloram (Tordon)  
Propachlor (Ramrod)  
Propazine (Milogard)



Stream Program - continued

Simazine

Toxaphene

Non-Routine "Organic" Parameters

Diazinon

Deethylatrazine

Deisopropylatrazine

Prometon

## Fish Tissue Program

### Fillet Analysis

#### Routine Inorganic Parameters

Cadmium

Lead

Mercury

#### Routine Organic Parameters

p,p'-DDD

p,p'-DDE

p,p'-DDT

Dieldrin

Heptachlor

Heptachlor epoxide

Hexachlorobenzene

gamma-Hexachlorocyclohexane

PCB-1016

PCB-1221

PCB-1232

PCB-1242

PCB-1248

PCB-1254

PCB-1260

Pentachloroanisole

Technical Chlordane

Oxychlordane

cis-Chlordane

trans-Chlordane

cis-Nonachlor

trans-Nonachlor

Trifluralin (Treflan)

### Wholefish Analysis

#### Routine Inorganic Parameters

Cadmium

Lead

Mercury

Selenium

#### Routine Organic Parameters

1,2,4,5,-Tetrachlorobenzene

p,p'-DDD

p,p'-DDE

p,p'-DDT

Diazinon

Dieldrin

Heptachlor

Heptachlor epoxide

Hexachlorobenzene

gamma-Hexachlorocyclohexane

Mirex

PCB-1248

PCB-1254

PCB-1260

Pentachloroanisole

Technical Chlordane

Trifluralin (Treflan)

## Lake Program

### Routine "Inorganic" Parameters

Alkalinity, total  
Aluminum  
Ammonia  
Antimony  
Arsenic  
Barium  
Beryllium  
Boron  
Bromide  
Cadmium  
Calcium  
Chloride  
Chromium  
Cobalt  
Copper  
Fluoride  
Hardness, total  
Iron  
Kjeldahl nitrogen  
Lead  
Magnesium  
Manganese  
Mercury  
Molybdenum  
Nickel  
Nitrate  
Nitrite  
Ortho-phosphate  
pH  
Phosphorus, total  
Potassium  
Selenium  
Silica  
Silver  
Sodium  
Specific conductance  
Strontium  
Sulfate  
Thallium  
Total dissolved solids  
Total organic carbon  
Total suspended solids  
Turbidity  
Vanadium  
Zinc

### Routine Microbiological Parameters

Fecal coliform bacteria

### Routine Organic Parameters

2,4-D  
2,4,5-T  
Acetochlor  
Alachlor  
Aldrin  
Atrazine  
Butachlor  
Carbofuran  
Chlordane  
Cyanazine  
DCPA (Dacthal)  
p,p'-DDD  
p,p'-DDE  
p,p'-DDT  
Dieldrin  
Endosulfan I & II  
Endosulfan sulfate  
Endrin  
Alpha BHC  
Beta BHC  
Gamma BHC (Lindane)  
Delta BHC  
Heptachlor  
Heptachlor epoxide  
Hexachlorobenzene  
Hexachlorocyclopentadiene  
Methoxychlor  
Metolachlor  
Metribuzin  
PCB-1016  
PCB-1221  
PCB-1232  
PCB-1242  
PCB-1248  
PCB-1254  
PCB-1260  
Picloram  
Propachlor  
Propazine  
Silvex (2,4,5-TP)  
Simazine  
Toxaphene

## Lake Program - continued

### Miscellaneous

Algal taxonomy\*  
Chlorophyll-a  
Dissolved oxygen  
Macrophyte abundance\*  
Photosynthetically active radiation (PAR)\*  
Secchi depth\*  
Temperature  
Total inorganic carbon (by calculation)

\* not chemical analyses

### Occasional Parameters (special projects)

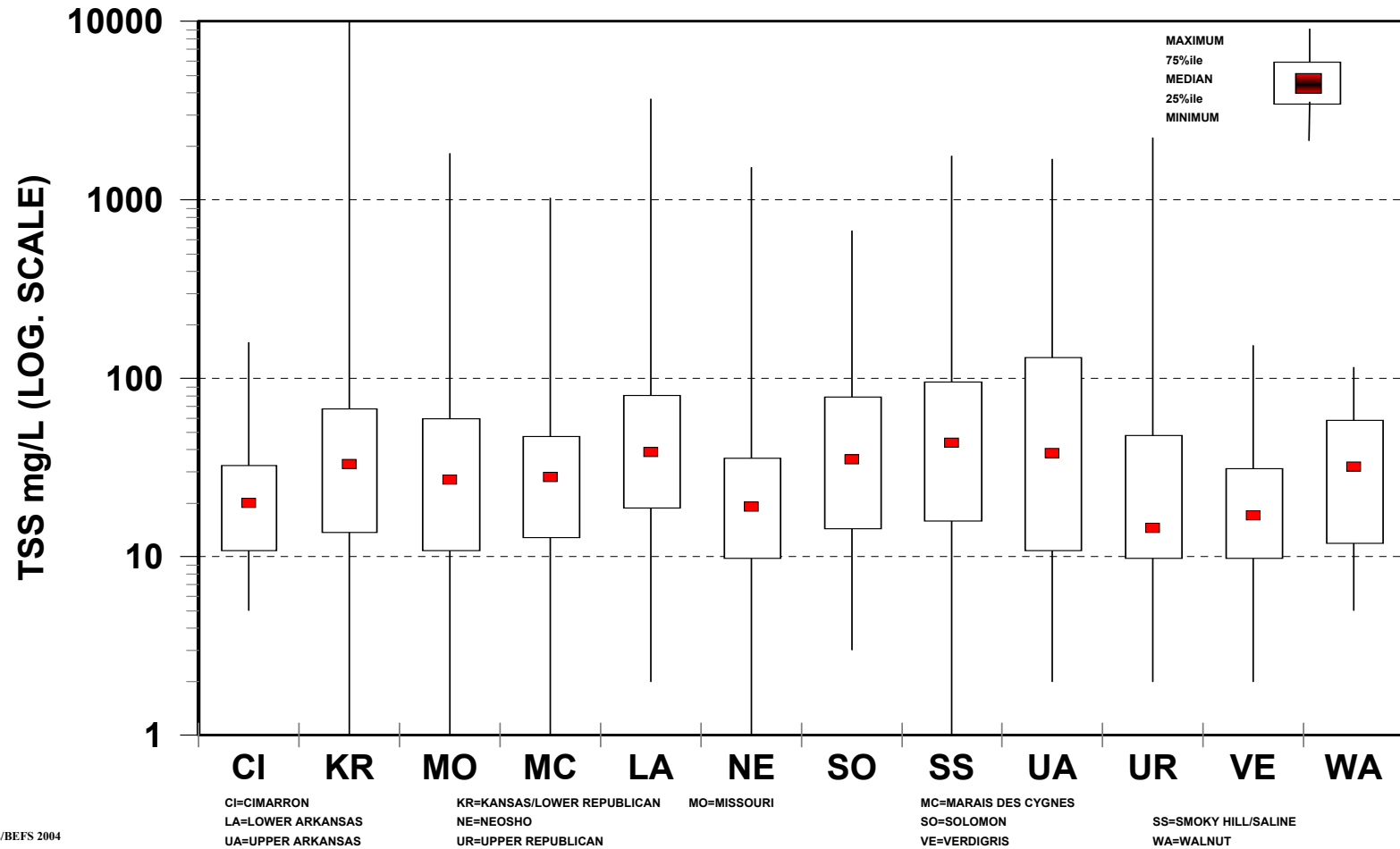
Biological oxygen demand  
Chemical oxygen demand  
Deethylatrazine  
Deisopropylatrazine  
Zooplankton taxonomy\*

\* not chemical analyses

# APPENDIX B

## TSS CONCENTRATIONS IN KANSAS BASINS

### 2000-2003



KDHE/BEFS 2004

## APPENDIX C STREAM ASSESSMENT PROTOCOL

USE DATA COLLECTED AT KDHE STREAM  
CHEMISTRY MONITORING SITES THROUGH 2000-2003  
(STORED ON AN AS400 MAINFRAME)



APPLY SCREENING PROGRAM  
FOR THE SEVEN USES BY PARAMETERS  
AS DETERMINED BY KANSAS WATER QUALITY STANDARDS  
(2003,2001)



CREATE DATABASE (\*.dbf) LISTING  
VIOLATION LEVELS BY PARAMETERS

VIOLATION LEVEL 1 ASSIGNED FS (FULLY SUPPORTED)  
VIOLATION LEVEL 2 ASSIGNED PS (PARTIALLY SUPPORTED)  
AND VIOLATION LEVEL 3 ASSIGNED NS (NOT SUPPORTED)  
FOR A PARTICULAR USE



PLOT MAPS OF MONITORING SITES\* AND OTHER  
RELEVANT FACILITIES TO HELP WITH DETERMINING  
SOURCES FOR CAUSES OF IMPAIRMENTS

USE NHD COVERAGE (MODIFIED BY KDHE) FROM NRCS  
DESIGNATIONS FROM KANSAS EXCEPTED FOR FECAL  
UPDATE MONITORING SITES FOR 2000-2003

INSERT REQUIRED DATA INTO 305(B) TABLES



USE QUERY IN ARCGIS 8.2 TO CALCULATE  
MILES OF USE SUPPORT, CAUSES, AND SOURCES  
TO OBTAIN DATA FOR REPORT



INCORPORATE ASSESSED DATA COLLECTED FROM  
BIOLOGICAL MONITORING SITES (1998-2001)  
INCLUDING MUSSEL DATA; ADD IMPAIRMENTS DUE  
TO FISH BIOACCUMULATION; MODIFY SUPPORT  
LEVELS, CAUSES AND SOURCES AS INDICATED



ADD CAUSES AND SOURCES BY SITE ARCGIS 8.2,  
TO GEOREFERENCED COVERAGE OF STATIONS WITH  
SEGMENTS/SUBSEGMENTS ASSIGNED\*



ASSIGN SOURCES MANUALLY, APPLY BEST  
PROFESSIONAL JUDGMENT WHERE APPROPRIATE  
APPLY TOXICANT CRITERIA



## APPENDIX D

### Clean Lakes and Wetlands

Only data differing significantly from the previous reporting cycle are provided.

#### Summary Statistics

**Table 1. Categories of Data used in ALUS Assessments for Lakes**

<b>DEGREE OF ALUS (acute criteria only)</b>	<b>ACRES ASSESSED BASED ON BIOLOGICAL HABITAT DATA ONLY</b>	<b>ACRES ASSESSED BASED ON PHYSICAL/CHEMICAL DATA ONLY</b>	<b>ACRES ASSESSED BASED ON/ BIOLOGICAL/CHEMICAL DATA</b>	<b>TOTAL ACRES ASSESSED FOR ALUS</b>
Insufficient data	0	0	0	7,077
Fully supported	0	0	75,448	75,448
Threatened			25,453	25,453
Partially supported	0	0	61,259	61,259
Not supported	0	0	18,953	18,953

**Table 2. Lake Acreage With Identifiable Point and Nonpoint Source Pollution Contributions**

<b>POLLUTION TYPE</b>	<b>NUMBER OF LAKES*</b>	<b>ACRES OF LAKES</b>
Point Sources	27	146,372
Nonpoint Sources	230	168,749
No Identifiable Pollution Sources	86	19,441

\*Numbers include any level of point source inputs, and any magnitude or combination of NPSs. Due to the fact that a number of lakes have both source types within their watersheds, the numbers will not necessarily total to the acres/numbers of lakes reported in this chapter.

## Clean Lakes Program

Only data differing significantly from the previous reporting cycle are provided.

### Background

A total of 316 publicly owned or publicly accessible lakes are included in this reporting cycle. This represents all such lakes known to KDHE through monitoring activities and reports published by other agencies. These lakes comprise 188,190 surface acres.

### Trophic Status

The greatest portion of lakes fall into the slightly-to-very eutrophic categories, while the vast majority of surface acreage falls into the argillotrophic and slightly-to-fully eutrophic categories. This primarily results from the influence that lake size (area, volume, depth) exerts on lake trophic state development. Many of the larger lakes in the state are mesotrophic-to-eutrophic, or suffer from high turbidity, while many of the small lakes in Kansas develop hypereutrophic conditions, based in some part on hydrologic and morphometric influences. While a significant percentage of reported lakes have not been assessed for their trophic status (13.6%). They constitute only about 4% of the total reported acreage. The increase in the mesotrophic and oligo-mesotrophic classes, since the last reporting cycle, can be attributed to the drought conditions of the last few years.

**Table 3. Trophic Status of Lakes Assessed During This Reporting Cycle** (Percent of total in parentheses)

TROPHIC STATUS	NUMBER OF LAKES	ACREAGE OF LAKES
Argillotrophic	16 (5.1)	51,140 (27.2)
Oligo-Mesotrophic	13 (4.1)	405 (0.2)
Mesotrophic	34 (10.8)	11,738 (6.2)
Slightly Eutrophic	41 (13.0)	53,204 (28.3)
Fully Eutrophic (Eutrophic)	58 (18.4)	47,621 (25.3)
Very Eutrophic	39 (12.3)	13,605 (7.2)
Low Hypereutrophic	24 (7.6)	646 (0.3)
High Hypereutrophic	48 (15.2)	2,529 (1.3)
Dystrophic	0	0
Unknown	43 (13.6)	7,302 (3.9)
Total	316 (100.0)	188,190 (100.0)



### Control Methods

(No new data to report.)

### Restoration/Rehabilitation Efforts

(No new data to report.)

### Impaired and Threatened Lakes

Table 4 summarizes overall use support ratings for lakes assessed during this reporting cycle. Impairments related to chronic aquatic life support criteria were not included in the analysis. Support rating for individual designated uses for lakes is presented in Table 5.

**Table 4. Summary of Fully Supporting, Threatened, and Impaired Lakes**

DEGREE OF USE SUPPORT	ASSESSMENT CATEGORY		TOTAL ASSESSED ACRES
	EVALUATED	MONITORED	
Insufficient Data	7,038	39	7,077
Fully Supporting of all uses	932	27,332	28,264
Threatened for one or more uses	325	16,684	17,009
Size impaired for one or more uses	4,186	131,654	135,840
Total size assessed	12,481	175,709	188,190

The majority of lake surface acres in Kansas are considered to be monitored (Table 4). This is primarily due to the inclusion of all the federal impoundments within the KDHE Lake and Wetland Monitoring Program. These 24 lakes comprise the majority of the reported surface acreage in the state.

All monitored lakes have data for a range of heavy metals and pesticides, including a number of those substances defined as “toxics” by the EPA. Out of the total reported acreage (188,190 acres) 175,709 acres are surveyed for total recoverable metals and pesticides (93.4% of the total). Of the total acres assessed for toxics, 19,459 acres (11.1% of total) demonstrated some level of impairment or exceedence due to metals or pesticides. This is significantly lower than reported in the last cycle. In large part, drought condition, and the reductions in runoff, can account for this change. Table 6 shows assessment data pertaining to the causes of use impairments in lakes in Kansas while Table 7 lists contaminant sources responsible for lake use impairments.

**Table 5. Individual Use Summary in Acres for Lakes**

GOALS	USE	SIZE ASSESSED	SIZE FULLY SUPPORTING	SIZE PARTIALLY SUPPORTING	SIZE NOT SUPPORTING	INSUFFICIENT DATA
			SIZE THREATENED			
Protect & Enhance Ecosystems	Aquatic Life (acute criteria)	188,190	75,448	61,259	18,953	7,077
			25,453			
Protect & Enhance Public Health	Fish Consumption **	188,190	165,188	10,194	328	12,480
			0			
	Shellfishing	*	*	*	*	*
	Primary Contact	188,190	41,612	112,258	3,877	7,077
			23,366			
	Secondary Contact	188,190	87,918	64,876	2,599	7,077
			25,720			
	Domestic Water Supply	188,190	31,981	89,105	36,661	7,077
			23,366			
Social & Economic Enhancement	Agricultural (irrigation)	188,190	137,601	14,970	2,822	7,077
			25,720			
	Agricultural (livestock)	188,190	137,290	14,930	3,173	7,077
			25,720			
	Cultural	*	*	*	*	*

\* = category not applicable

\*\* = based on fish consumption advisories and food procurement criteria

### Acid Effects on Lakes

A total of 175,709 acres of lakes in Kansas were monitored or evaluated for pH, out of the total reported during this cycle. Approximately 93% of reported lake acres were assessed for pH (100% of monitored lake acres).

A total of 4,724 lake acres were impacted by high pH during the 1999-to-2003 reporting period. In all cases, high summer time pH incidents are related to periods of intense phytoplankton or macrophytic productivity. The 68 acres impacted by low pH reflects the effects of spoil pile drainage from older coal mining operations.

**Table 6. Total Lake Acres Impacted by Various Cause Categories**

CAUSE CATEGORY	ACRES BY CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Cause unknown	0	0
Unknown toxicity	-	-
Pesticides	0	791
Priority organics	-	-
Nonpriority organics	-	-
Metals	0	19,713
Ammonia	-	-
Chlorine	-	-
Other inorganics (boron and fluoride)	41	204
Nutrients/eutrophication	26,054	120,155
pH	559	4,233
Siltation	*	*
Organic enrichment/low DO	190	33,566
Salinity/TDS/chlorides	9,216	23,382
Thermal modifications	-	-
Flow alterations	305	3,610
Other habitat alterations	-	-
Pathogen indicators	0	0
Radiation	-	-
Oil and grease	-	-
Taste and odor**	17,582	-
Suspended solids	42,659	19,438
Noxious aquatic plants	264	167
Total toxics	-	-
Turbidity	42,659	19,438
Exotic species	0	8,000
Other (specify)	-	-

- = Category applicable, no data available.

\* = Statewide problem, no direct measurements available

\*\* = Reflects problems severe enough to request KDHE assistance. The majority of incidents are unreported.

**Table 7. Total Lake Acres Impaired by Various Source Categories**

SOURCE CATEGORY	CONTRIBUTION TO IMPAIRMENT	
	MAJOR	MODERATE/MINOR
Industrial Point Sources	-	-
Municipal Point Sources	30,193	116,179
Combined Sewer Overflows	-	-
Agriculture	54,529	102,318
Silviculture	-	-
Construction	-	-
Urban Runoff/Storm Sewers	406	7,120
Resource Extraction	0	1,241
Land Disposals	-	-
Hydromodification	3,446	6,047
Habitat Modification	-	-
Marinas	-	-
Atmospheric Deposition	0	799
Contaminated Sediments	-	-
Unknown Source	0	0
Natural Sources*	9,879*	24,084*
In-Lake Management Techniques**	150	45
Other (specify)	-	-

- = Category applicable, no data available.

\* = Refers mainly to in-lake ecophysiological processes (processes secondary to eutrophication, for instance), wind resuspension phenomena, and climate variations, with very little actual background pollution loading from watersheds included, except for instances of excessive waterfowl.

\*\* = Some lake management techniques, such as aerators or algae control, can impair water quality in other ways.

### Trends in Lake Water Quality

Time trends in lake water quality are difficult to determine, given that the chemical data do not lend themselves well to statistical analysis at this time. Trophic state remains the indicator of overall lake water quality for the determination of trends within this report. If a given lake had trophic state assessments for three, or more, occasions during the last nineteen years, then a trend of "improving," "degrading," or "stable" was assigned. If no recent trophic state data were available, or if the most recent data were more than eight years old, then a trend classification of "unknown" was assigned. Table 8 presents the lake trophic state trends for this reporting period.

**Table 8. Trophic State Trends in Lakes** (% of total in parentheses)

CATEGORY	NUMBER OF LAKES	ACREAGE OF LAKES
Assessed for Trends	316 (100%)	188,190 (100%)
Improving	3 (0.9%)	6,906 (3.7%)
Stable	102 (32.3%)	133,168 (70.7%)
Degrading	35 (11.1%)	35,780 (19.0%)
Trend Unknown	176 (55.7%)	12,336 (6.6%)

According to the data in Table 8, the majority of lakes are of unknown trophic state trend, but they constitute less than seven percent of the total reported acreage. These are the small lakes that have undergone assessment, but have not been monitored for trophic state over time. Therefore, trends cannot be determined. Of the monitored lake acreage in Kansas, over 70% is stable over time, while 19% appears to be degrading over time. Only about 4% of lake acres in the state have shown any appreciable improvement in trophic state condition during this reporting cycle.

## **Wetlands Assessment**

(Only data differing significantly from the previous reporting cycle are provided.)

### **Extent of Wetland Resources**

(No new data to report.)

### **Integrity of Wetland Resources**

Out of the 35,607 wetland acres (35 wetlands) assessed during this reporting cycle, 25,069 acres (9 wetlands) are considered to be monitored sites. This represents 70% of the total acres reported, and 26% of the total number of reported wetlands. An additional 10,538 acres of wetland are reported as evaluated (26 wetlands, 74% of the total). Roughly 51% of the state's wetland acres have been assessed chemically and/or biologically (18 wetlands, 26,439 acres).

At a minimum wetlands are designated for secondary contact recreation, food procurement, and aquatic life support uses. Wetlands generally have not been designated for other uses in Kansas. Overall aquatic life use support (acute criteria only, with the exception of pesticides) is as follows, in terms of total reported acreage (monitored and/or evaluated sites): 30 acres are fully supported (<1%), 9,092 acres have insufficient data for an assessment (26%), 1,571 acres are partially supported (4%), and 24,914 acres are not supported (70%). These numbers refer primarily to exceedences of acute aquatic life support criteria, although numbers were not significantly different when chronic criteria were analyzed.

Levels of secondary contact recreational use support are as follows, in terms of reported acreage: 64 acres are fully supported (<1%), 9,092 acres have insufficient data for an assessment (26%), 2,702 acres are partially supported (8%), and 23,749 acres are not supported (67%).

The primary causes of partial and/or nonsupport of designated uses in Kansas' wetlands are excessive nutrient load, heavy metals, salinity, elevated pH, flow alterations, low dissolved oxygen, and turbidity/siltation. The major sources of partial and/or nonsupport of designated uses are agriculture, hydromodifications in watersheds, and natural processes (wetland ecophysiological processes and natural climate variations).

Out of the 25,069 monitored wetland acres in Kansas, 100% are monitored for toxics (heavy metals, pesticides, and ammonia). Due to a special wetland assessment project (completed 2001) a large number of normally evaluated wetlands were assessed for toxics through the year 2000. During this reporting cycle, 17,274 acres of wetlands were impacted by toxics (49% of reported acres).

During this reporting cycle, 24,845 wetland acres were assessed as hypereutrophic (69.8%), 139 acres were assessed as slightly-to-very eutrophic (0.4%), 31 acres were assessed as mesotrophic (<0.1%), and 9,092 acres were not assessed for trophic state (25.5%). Another 1,500 acres were assessed as argillotrophic reported wetland acres, trends in trophic status were as follows: 29% were stable over time (10,2 (4.3%). Out of the 26 acres), 46% were degrading over time (16,219 acres), and trends in 26% (9,162 acres) were unknown.

**Development of Wetland Water Quality Standards**

(No new data to report.)

**Additional Wetland Protection Activities**

(No new data to report.)